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# OCCUPATIONAL STRESS AND ILLNESS INCIDENCE

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## Summary

The purpose of this study was to examine the hospitalization rates for 10 stress-related illnesses (alcoholism, neuroses, psychoses, transient situational disturbance, hypertension, ischemic heart disease, other heart disease, cerebrovascular disease, ulcers, and diabetes mellitus) among 13 Navy occupational groups during four phases of a 30-year career. The four phases included the first enlistment, the second and subsequent enlistments during the first decade of a career, the second decade, and the third decade. The cohorts selected for this longitudinal study, which covered the 11 years from 1966 through 1976, numbered 130,258 in 1966, 30,393 in 1955-56, and 19,471 for 1945-47. Each of these cohorts was divided into 13 occupational groups: Electronics, Administrative/Clerical, Miscellaneous/Technical, Aviation (mechanics), Electrical, Communications, Engineering/Hull, Service, Ordnance, Deck (and aviation-related), Construction/Manufacturing, Mess Management Specialist, and Hospital Corpsman.

Results of comparisons across the 13 occupational groups showed that men assigned to the Hospital Corpsman and Mess Management Specialist groups had the highest health risks for stress-related illness during almost all decades of a Navy career. Rates also were elevated for the groups of Construction/Manufacturing, Deck, Ordnance, and Engineering/Hull while the lowest rates were observed for the groups of Miscellaneous/Technical, Electronics, and Administrative/Clerical.

In comparisons across decades, rates for stress-related illness increased as much as tenfold from the first enlistment to the third decade, as noted for such conditions as hypertension, cardiovascular disease, diabetes mellitus, and ulcers. Of importance was the finding that not only were the rates substantially higher across the years but the rates for these four diagnoses varied markedly across occupational groups. For example, Construction/Manufacturing and Electrical personnel had the highest rates during the third decade for hypertension and ischemic heart disease, respectively. Rates for Mental Disorders tended to be less variable across decades and alcoholism emerged as a problem of considerable magnitude during the second enlistment.

Other comparisons identified occupational groups with high and low stress ratings for environmental characteristics, occupational stressors, and career considerations. High mean stress scores in these three domains composed of 13 dimensions were observed for Mess Management Specialist and Engineering/Hull personnel whereas low mean scores were noted for the groups of Electronics, Miscellaneous/Technical, and Administrative/Clerical. Another category, the Nondesignated group, had elevated hospitalization rates as well as the highest mean ratings on the job stress measures.

On the basis of these results, recommendations could be made to improve the environmental conditions of several occupational groups. Other risk factors, such as life style, personal habits, family history, and self-selection variables, also should be examined to determine their associations with stress-related illness. Information from the present and further research can establish the basis for the development of effective health care prevention and intervention programs.

### Abstract

This study examined hospitalization rates for 10 stress-related illnesses among Navy occupational groups during four phases of a 30-year career and identified possible reasons for differences in health risks among occupations and career phases. Results of this longitudinal study, which covered 11 years and included an initial population of 184,122 male Navy enlisted Caucasians, showed that men assigned to Hospital Corpsman and Mess Management Specialist (culinary work) categories had the highest health risks for stress-related illness during nearly all phases or decades of a Navy career. Other groups with elevated hospitalization rates included Construction/Manufacturing, Deck, Ordnance, and Engineering/Hull whereas the lowest rates were observed for Miscellaneous/Technical, Electronics, and Administrative/Clerical. The highest hospitalization rates for stress-related diseases were evidenced during the third decade. Job stress scores were computed from ratings of environmental characteristics, occupational stressors, and career considerations; high scores on these dimensions tended to be associated with increased illness. Implications of these results for prevention programs were discussed.

### Introduction

Since the early 1950s, increasing numbers of research projects have been devoted to studying the effects of occupational stress in the work place, particularly the degree to which workers' productivity is affected. Findings from these studies have resulted in an expanded awareness of the impact of stress upon workers' health. It has been postulated that the incidence of disease or risk of illness varies according to the extent and types of job stress in the work setting. Such research has evolved from the need to institute intervention programs which will reduce absenteeism, morbidity, and mortality. This study will identify occupations with high and low levels of illness incidence/risk as well as possible sources of occupational stress.

Several occupations and illnesses have been identified in the research literature as associated with high levels of occupational stress. Well-known among these studies is the research on air traffic controllers who tend to have an excessive risk of developing such stress-related illnesses as hypertension, peptic ulcers, and diabetes.<sup>1</sup> Caplan and his associates<sup>2</sup> also report that several of 23 occupational groups studied demonstrate increased incidence rates for cardiovascular disease, peptic ulcer, gastrointestinal problems, and respiratory infections, four disorders believed to be related to stress. As an example, professors holding positions in department administration have three times as much heart disease as professors engaging primarily in teaching and research. Other researchers have shown that such Navy occupational groups as Engineering/Hull maintenance and Deck specialties report more illness than individuals assigned to Administrative/Clerical and Electronics occupations.<sup>3,4</sup> The ordering of these Navy occupational groups on morbidity indices corresponds with the ordering on measures of physical job demands.

On the basis of such results, numerous occupational stressors have been identified and examined as correlates of illness incidence or risk. Weiman<sup>5</sup> reports that scores on a measure of job stress (e.g., responsibility for others, work load, role ambiguity) form a U-shaped curve when plotted against incidence of seven diseases. That is, high and low stress levels are observed to be associated with conditions commonly regarded as stress-related, which lends support to Selye's theoretical model of the relationship between stress and levels of stimulation.<sup>6</sup> In other words, extremes of too much or too little occupational stress contribute to increased incidence and risk of the illness noted above as well as other heart diseases and mental disorders.<sup>7,8</sup>

The sources of occupational stress selected for this study can be divided into three domains: (1) Environmental Factors such as physical arduousness, noise, temperature, toxicity, and hazards; (2) Job Characteristics such as work load, responsibility for others, job simplicity/complexity, underutilization, and participation; and (3) Career Considerations such as job status, future job opportunities (transferability of skills to civilian jobs), and aptitude. Definitions of these constructs have been presented in considerable detail by other researchers.<sup>2,9</sup>

The practical extension of these studies of occupations, illness incidence/risk, and occupational sources of stress is the development of strategies to prevent stressors from impacting upon workers' health.<sup>10</sup> In the Navy, researchers have been tasked with identifying high and low health risk occupations during various career phases. Of special concern are the long-term effects of occupational stress and job demands upon the health and performance of individuals who remain in the Navy beyond 20 years. Results of these longitudinal studies can be used to more effectively plan preventive actions and initiate intervention programs throughout all phases of a career. Further, studies involving Navy personnel offer several research advantages on that comparative analyses can be conducted among numerous occupations, across large cohort samples, within sub-categories of personnel controlling on age and other important variables, for one or multiple diagnoses, and after follow-up periods that can extend to more than 10 years.

The purpose of this study is to determine the stress-related health risks of Navy enlisted occupations during four phases of a 30-year career progression and to identify the possible reasons for differences among occupations and career phases. Specifically, this study will examine hospitalization rates for 10 diagnostic conditions among 13 occupational groups during the first, second, and third decades of a Navy career in order to identify: (1) occupational groups with high and low stress-related illness rates; (2) the time period or critical decade of a career when enlistees would be most vulnerable to illness; and (3) environmental factors, occupational stressors, and career considerations associated with high and low risk occupations.

#### Method

##### Participants

Participants in the study include all Navy enlisted male Caucasians who were on active duty for any period from January 1966 through December 1976 and who began active service during one of three time frames: 1966 ( $n = 130,258$ ), 1955-56 ( $n = 30,393$ ), and 1945-1947 ( $n = 19,471$ ). These cohorts represented each of three decades of a Navy career, i.e., the first, second, and third, respectively. For the first decade, the cohort consisted of 130,258 men who began service in 1966 and 14,987 who remained on active duty after the first enlistment. Ages for each of the three cohorts tended to fall within a narrow interval with modal birth years of 1948, 1937, 1928, respectively. Each cohort was divided into 13 occupational groups (e.g., Electronics, Engineering/Hull, Administrative/Clerical), which are listed in Table 1. The criteria used in clustering occupational specialties into 13 occupational groups were comparability of: (1) scores on aptitude measures, (2) work tasks, and (3) work settings. Another category, the nondesignated group, is not included in the tables and consists of individuals who have not been assigned to an occupational specialty or who have been demoted from a specific job. Enlistees in this group typically perform such menial tasks as chipping paint, cleaning equipment, running errands, scrubbing decks, and helping with mess duties. Because this group is not a distinct occupational category, it is considered separately from the specific occupations.

##### Procedure

Service history data for each cohort were extracted from the Naval Health Research Center's computerized files which include records of all active duty personnel who served in the Navy for any time period from January 1966 through March 1978. After creating files for the specified cohorts, the records were matched against inpatient medical data obtained from the Naval Medical Data Services Center in Bethesda, Maryland. This data source consists of hospitalization records for all Navy personnel admitted to naval medical facilities from January 1966 through December 1976. Data selected from the service and medical history records were: primary diagnosis for each hospitalization, occupation at the time of hospitalization, date of admission, reason for separation from active duty, and date of discharge or retirement.

The diagnoses included in this study have been identified in the research literature as stress-related: alcoholism, psychoses, neuroses, transient situational disturbance, hypertension, ischemic heart disease, other heart disease, cerebro-vascular disease, ulcers, and diabetes mellitus. During the 11-year period from January 1966 through December 1976, all

stress-related hospitalizations were tallied for each of the occupational groups in each cohort. For the 1966 group, the decade was divided into the first enlistment and the remaining years. Hospitalization rates per 100,000 men for the 10 diagnoses were then computed for each occupational group in the three specified cohorts. Populations at risk for the occupational groups were determined as follows: (1) the numbers of men on active duty for each year of the 1966 to 1967 time period were tabulated for each of the occupational groups by cohort; (2) on the basis of these tabulations, the mean population for each 12-month period of the decade was established; and (3) the mean population values were summed across the decade for each occupational group by cohort. The  $\chi^2$  technique was employed to determine whether or not the numbers of hospitalizations differed significantly between the two cohorts or occupations.

Each occupation was rated on 13 dimensions or sources of job stress by experienced Navy personnel ( $N = 76$ ), many of whom were assigned to shipboard duty. The ratings for each dimension ranged from 1 through 5 to reflect the degree of job stress from low to high levels. Estimates of internal consistency (coefficient alpha) were computed for each domain and were found to be acceptable ( $\geq .55$ ). Mean scores were calculated for each dimension, the three domains, and the total of all 13 dimensions by occupational group. A one-way analysis of variance was conducted for each set of ratings across groups to determine whether or not there were significant differences among occupations.

#### Results

##### High and Low Hospitalization Rates by Occupation Across Three Decades

The First Decade, First Enlistment. The first phase of this study is designed to identify Navy occupational groups with the highest and lowest hospitalization rates for each of the four specified cohorts. Table 1 is a presentation of hospitalization rates compiled for the first 4-year tour of duty. As shown, annual rates across occupations generally are quite similar except for the Hospital Corpsman group which has the highest rates for neuroses, transient situational disturbance, and overall hospitalizations. In general, hospitalization rates for nearly all diagnoses tend to be comparable across all occupations except the Hospital Corpsman specialty.

Table 1  
Hospitalization Rates for Stress-Related Diagnoses by Occupational Group<sup>a</sup>  
(1966 Cohort, First Enlistment)

<u>Diagnosis</u>	<u>Occupational Group<sup>b</sup></u>												
	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>10</u>	<u>11</u>	<u>12</u>	<u>13</u>
Alcoholism	0	6	12	12	10	8	11	10	23	15	29	26	17
Neuroses	92	61	85	62	75	53	93	102	70	105	86	128	372
Psychoses	51	29	53	47	34	36	32	32	46	70	41	64	143
Transient Situational Disturbance	44	38	33	37	21	55	40	41	9	80	62	38	289
Hypertension	41	52	68	53	14	45	45	28	18	30	58	116	143
Ischemic Heart Disease	0	0	0	0	0	4	0	0	0	5	0	0	0
Other Heart Disease	16	6	15	28	7	32	22	8	23	5	16	13	50
Cerebrovascular Disease	6	6	2	0	7	6	2	0	0	0	0	12	7
Ulcers	13	50	35	22	41	28	36	45	56	50	37	64	133
Diabetes Mellitus	29	15	10	22	10	2	13	0	18	5	12	26	50
Total Hospitalization Rate	292	263	313	283	219	269	294	276	263	365	341	488	1204

<sup>a</sup>Hospitalization rate is the number of admissions per 100,000 strength per annum.

<sup>b</sup>1 = Miscellaneous/Technical; 2 = Administrative/Clerical; 3 = Electronics; 4 = Aviation; 5 = Electrical; 6 = Communications; 7 = Engineering/Hull; 8 = Service; 9 = Ordnance; 10 = Deck; 11 = Construction/Manufacturing; 12 = Mess Management Specialist; 13 = Hospital Corpsman.

The First Decade, Second Enlistment. Hospitalization rates for men who served on active duty during the remaining years of the first decade are presented in Table 2. Rates for the 13 occupational groups show substantially greater variability than during the first enlistment for many diagnoses, particularly psychiatric disorders. Groups with the highest overall rates for the 10 diagnoses--values that fall within a range from 294 to 2,442--are Hospital Corpsman, Construction/Manufacturing, Deck, and Mess Management Specialist (culinary work). Groups with the lowest rates are Administrative/Clerical and

Miscellaneous/Technical (e.g., Data Processor).

For specific diagnoses and occupations, alcoholism accounts for the highest hospitalization rate, of all diagnoses for seven occupational groups, although the values vary considerably. Elevated rates are observed for the Deck, Construction/Manufacturing, and Engineering/Hull specialties and very low rates are noted among men assigned to Administrative/Clerical, Electronics, and Miscellaneous/Technical jobs. Hospitalization rates for neuroses are the highest for the occupational groups of Hospital Corpsman and Mess Management Specialist.

Table 2  
Hospitalization Rates for Stress-Related Diagnoses by Occupational Group<sup>a</sup>  
(1966 Cohort, Second + Enlistment)

Diagnosis	<u>Occupational Group<sup>b</sup></u>												
	1	2	3	4	5	6	7	8	9	10	11	12	13
Alcoholism	162	42	125	241	298	358	713	566	518	1142	741	300	226
Neuroses	121	126	193	281	209	230	162	288	403	370	601	995	95
Psychoses	81	84	91	120	42	239	23	0	115	269	556	0	45
Transient Situational Disturbance	81	0	182	281	340	299	115	404	173	67	93	450	452
Hypertension	40	0	182	161	42	119	69	0	0	67	185	300	181
Ischemic Heart Disease	0	42	0	41	0	0	0	0	0	0	93	0	0
Other Heart Disease	40	0	34	0	42	60	207	81	0	0	0	150	317
Cerebrovascular Disease	0	0	23	0	0	30	0	0	0	0	0	0	0
Ulcers	40	0	68	80	42	90	115	324	0	67	93	150	226
Diabetes Mellitus	0	0	23	40	0	60	0	81	173	67	93	0	0
Total Hospitalization Rate	565	294	921	1244	1104	1464	1472	1618	1267	2082	2224	1951	2442

<sup>a</sup>Hospitalization rate is the number of admissions per 100,000 strength per annum.

<sup>b</sup>1 = Miscellaneous/Technical; 2 = Administrative/Clerical; 3 = Electronics; 4 = Aviation; 5 = Electrical; 6 = Communications; 7 = Engineering/Hull; 8 = Service; 9 = Ordnance; 10 = Deck; 11 = Construction/Manufacturing; 12 = Mess Management Specialist, and 13 = Hospital Corpsman.

The Second Decade. As presented in Table 3, total stress-related illness hospitalization rates for men who enlisted in 1955-1956 are quite variable across occupational groups from a high value of 2,764 for Hospital Corpsmen to a low of 1,136 for the Miscellaneous/Technical category. Other groups with low rates include: Electronics, Administrative/Clerical, Aviation (mechanics), Communications, and Electrical.

Table 3  
Hospitalization Rates for Stress-Related Diagnoses by Occupational Group<sup>a</sup>  
(1955-1956 Cohort)

Diagnosis	<u>Occupational Group<sup>b</sup></u>												
	1	2	3	4	5	6	7	8	9	10	11	12	13
Alcoholism	299	485	318	412	515	465	582	536	583	691	469	864	742
Neuroses	173	126	206	192	190	221	211	206	176	221	166	221	402
Psychoses	60	28	59	85	141	31	50	45	64	86	37	201	138
Transient Situational Disturbance	106	183	132	99	153	163	184	89	88	202	74	141	264
Hypertension	86	119	108	114	86	104	125	179	88	259	240	80	188
Ischemic Heart Disease	126	91	147	85	129	85	148	170	200	173	111	60	314
Other Heart Disease	40	98	64	78	18	89	48	116	72	48	111	60	113
Cerebrovascular Disease	20	7	10	7	6	12	12	27	32	10	18	50	0
Ulcers	160	162	176	224	215	221	291	304	248	202	277	221	415
Diabetes Mellitus	66	84	93	138	55	93	116	98	232	144	111	281	188
Total Hospitalization Rate	1136	1383	1313	1434	1508	1484	1767	1770	1783	2036	1644	2189	2764

<sup>a</sup>Hospitalization rate is the number of admissions per 100,000 strength per annum.

<sup>b</sup>1 = Miscellaneous/Technical; 2 = Administrative/Clerical; 3 = Electronics; 4 = Aviation; 5 = Electrical; 6 = Communications; 7 = Engineering/Hull; 8 = Service, 9 = Ordnance; 10 = Deck; 11 = Construction/Manufacturing; 12 = Mess Management Specialist; 13 = Hospital Corpsman.

In comparing rates of alcoholism, the values fall within a range of 299 for the Miscellaneous/Technical group to 864 for

Mess Management Specialists, although the rates for most groups are between 400 and 600. Somewhat elevated rates are observed for hypertension in the Deck and Construction/Manufacturing groups while Mess Management Specialists have the highest rate for diabetes mellitus.

The Third Decade. Table 4 is a presentation of the hospitalization rates for the occupational groups in the 1945-47 cohort. The occupational groups with the highest rates during a third decade of service include the following: Mess Management Specialist, Construction/Manufacturing, Hospital Corpsman, and Ordnance. The groups with the lowest rates are Miscellaneous/Technical, Electronics, and Administrative/Clerical. The range for these rates is from a high of 5,661 to a low of 3,067.

Hospitalization rates for the third decade cohort show an increased risk for diagnoses associated with organic dysfunction as contrasted with lower rates for behavioral disorders. To be specific, the highest rates for nearly all occupational groups are for diabetes mellitus, hypertension, and ulcers. Occupational groups with the highest rates for diabetes mellitus are Mess Management Specialist, Hospital Corpsman, and Ordnance personnel. Hypertension is the leading reason for hospitalization for the Construction/Manufacturing group; Mess Management Specialists have the second highest rate for this condition. Ulcer conditions are most common among Ordnance, Engineering/Hull, and Deck personnel. Elevated rates for ischemic heart disease are observed for several groups, particularly the Electrical, Mess Management Specialist, and Construction/Manufacturing groups.

Table 4  
Hospitalization Rates for Stress-Related Diagnoses by Occupational Group<sup>a</sup>  
(1945-1947 Cohort)

<u>Diagnosis</u>	<u>Occupational Group<sup>b</sup></u>												
	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>10</u>	<u>11</u>	<u>12</u>	<u>13</u>
Alcoholism	314	526	306	441	386	385	528	594	1001	491	557	325	414
Neuroses	79	447	139	382	442	549	293	327	360	304	502	696	829
Psychoses	79	53	56	118	0	55	59	89	240	47	0	93	46
Transient Situational Disturbance	197	158	56	147	110	192	98	238	40	164	39	278	460
Hypertension	629	684	890	794	938	824	880	713	561	748	1672	1114	829
Ischemic Heart Disease	275	605	445	794	993	577	587	505	601	491	892	882	506
Other Heart Disease	118	53	111	147	331	275	235	178	240	164	502	139	322
Cerebrovascular Disease	79	0	84	29	110	28	78	89	40	47	279	46	138
Ulcers	629	500	362	794	662	714	939	802	1001	911	446	742	691
Diabetes Mellitus	668	631	696	559	497	714	763	743	1041	771	334	1346	1151
Total Hospitalization Rate	3067	3657	3145	4205	4469	4313	4460	4278	5125	4138	5574	5661	5386

<sup>a</sup>Hospitalization rate is the number of admissions per 100,000 strength per annum.

<sup>b</sup>1 = Miscellaneous/Technical; 2 = Administrative/Clerical; 3 = Electronics; 4 = Aviation; 5 = Electrical; 6 = Communications; 7 = Engineering/Hull; 8 = Service; 9 = Ordnance; 10 = Deck; 11 = Construction/Manufacturing; 12 = Mess Management Specialist, and 13 = Hospital Corpsman.

#### Career Phases Associated with Stress-Related Illness

Across cohorts, rates of increase in hospitalizations by occupational group are compared using the first enlistment rates as baseline values. Groups with the largest difference ratios from the first to the second enlistment include Construction/Manufacturing, Service, Deck, and Communications. Increases in rates are greater than fivefold for these groups. Alcoholism becomes a high risk problem beginning with the second enlistment, as shown in the large increments in rates of all occupations. Other large increments are observed for neuroses.

From the second enlistment to the second decade, the largest proportion of increase is for Administrative/Clerical personnel, although their overall second decade rate is one of the three lowest rates among the occupational groups. For several groups, the difference in total rates between cohorts is minimal, as observed for Communications, Service, Aviation, Deck, and Mess Management Specialist groups.

Of the career phases examined in this study, the most critical, as reflected by the highest rates, is the third decade. Differences in total hospitalization rates between the second and third decade cohorts are at least twofold for each of the occupational groups. For such specific diagnoses as diabetes mellitus, hypertension, ulcers, and ischemic heart disease, the discrepancies in rates between cohorts are considerably higher--as much as 10 times for several occupational groups. Rates for alcoholism show a decrease or a minimal change between cohorts for most occupations except for a doubling of rates among Ordnance personnel.

In comparing rates across the three cohorts, the largest differences are noted for the groups of Mess Management Specialist, Construction/Manufacturing, Ordnance, Electrical, and Engineering/Hull. Other comparisons show that the most dramatic shift in the rank ordering from low to high hospitalization rates across cohorts is observed for Electrical and Ordnance personnel, whereas a change from a high to low rank ordering across cohorts can be seen for Deck and Service specialties. Most of the other occupational groups occupy the same or adjoining positions in the rank orderings across cohorts.

#### Sources of Job Stress among Navy Occupations

In addition to comparing hospitalization rates for stress-related illnesses among occupations and cohorts, the third facet of this study consists of comparing the levels of job stress assessed for the various occupational groups. To be considered are environmental factors, occupational stressors, and career considerations. These factors have been implicated in the research literature cited earlier as related to the pathogenesis of stress-related illness. A description of each dimension and the mean ratings for selected occupational groups are presented in Table 5.

Table 5  
Mean Ratings of Job Stressors for Nine Navy Enlisted Occupational Groups  
Rank-Ordered by Hospitalization Rates for 1966-76<sup>a</sup>

	<u>Occupational Group<sup>b</sup></u>								
<u>Environmental Characteristics</u>	1	2	3	4	5	6	7	8	9
Physical demands of job--amount of exertion, strength, stamina required	2	2	3	2	4	4	5	2	2
Noise level--too loud, too high, too frequently	3	3	3	3	4	2	3	2	2
Temperature extremes--too hot, too cold, too variable	2	3	3	2	4	3	4	4	2
Contacts with toxic chemicals--too dangerous, too offensive	1	1	2	1	3	2	4	2	2
Hazardous conditions--too dangerous, too much risk	1	2	2	1	3	3	5	2	2
Subtotal	9	11	13	9	18	14	21	12	10
<u>Job Stressors</u>									
Work load--too much or too little to do, too much pressure, too fast	3	3	4	2	4	4	4	5	4
Responsibility for others--their well-being, morale, security	3	3	2	3	4	3	3	5	5
Job simplicity/complexity--too easy or too complicated	3	3	3	3	3	3	3	3	3
Underutilization--skills or capabilities not adequately utilized	2	2	3	2	3	3	2	3	3
Participation--too little say in deciding work tasks	2	2	4	2	4	4	3	4	4
Subtotal	13	13	16	12	18	17	15	20	19
<u>Career Considerations</u>									
Occupational status--job status compared with other jobs (reversed)	2	1	3	3	3	3	2	5	4
Future job opportunities--transferability of skills to civilian jobs (reversed)	2	1	2	3	2	3	1	2	4
Aptitudes required of job--job aptitudes compared with other jobs (reversed)	2	1	3	3	3	3	2	5	3
Subtotal	6	3	8	9	8	9	5	12	11
Total	28	27	37	30	44	40	41	44	40

<sup>a</sup>All F ratios are significant at the .05 level except for the dimensions Job Simplicity and Underutilization.

<sup>b</sup>1 = Miscellaneous/Technical and Administrative/Clerical; 2 = Electronics; 3 = Electrical; 4 = Communications;  
5 = Engineering/Hull; 6 = Ordnance; 7 = Construction/Manufacturing; 8 = Mess Management Specialist;  
9 = Hospital Corpsman.

Environmental Factors. The following five dimensions are included in this category: physical demands, noise level, temperature extremes, toxicity, and occupational hazards. Of the 13 dimensions rated, these show the greatest variability across occupations; the  $t$ -ratios for these five dimensions are all statistically significant. As would be predicted, the occupational groups with the highest mean ratings (levels of stress) are Construction/Manufacturing and Engineering/Hull. Groups exposed to few adverse environmental conditions include Electronics, Communications, Miscellaneous/Technical, and Administrative/Clerical specialties.

Occupational Stressors. Of the five dimensions assessed for this category, three variables differ significantly across occupations; the dimensions of Participation and Responsibility for Others show the greatest variability. The highest mean stress ratings for these variables are observed for the groups of Mess Management Specialist, Hospital Corpsman, and Engineering/Hull. Groups with the lowest mean ratings include Communications, Electronics, Miscellaneous/Technical, and Administrative/Clerical.

Career Considerations. Occupations with the least favorable career consideration scores are identified as Mess Management Specialist, Hospital Corpsman, and Ordnance.

Nondesignated Personnel. As indicated at the outset, the Nondesignated group is to be considered separately because of its unique status in the Navy. The mean ratings on the three sources of job stress are considerably higher than those for nearly all of the other groups: 22 for environmental characteristics, 20 for job stressors, and 15 for career considerations.

Overall hospitalization rates for men in this category also are the highest of all occupational groups for the 1966 and 1955-1956 cohorts; there are no men in the Nondesignated category for the 1945-1947 cohort. The total rates are 1,310, 3,979, 3,360, respectively, for the first enlistment, second enlistment, and second decade. Rates are consistently elevated for psychoses, neuroses, and alcoholism.

#### Discussion

Results of the first phase of this study show that men assigned to the Hospital Corpsman and Mess Management Specialist occupations have the highest overall hospitalization rates across the three decades of a 30-year Navy career. Rates also are elevated for the groups of Construction/Manufacturing, Deck, Ordnance, and Engineering/Hull while the lowest rates across the three decades are observed for the groups of Miscellaneous Technical, Electronics, and Administrative/Clerical. The consistency in this differentiation between the high and low risk groups for each decade provides evidence that the work environment and job demands have a powerful impact on the health of Navy personnel.

The second facet of this research centers on the identification of the decade of a Navy career with the highest hospitalization rates across the four time periods. In these comparisons, it is noteworthy that rates for stress-related illness increase as much as tenfold from the first enlistment to the third decade of a Navy career within several occupational groups. Rates for Mental Disorders, however, tend to be less variable across time for the majority of occupational groups. Alcoholism surfaces as a problem of considerable magnitude during the second enlistment, particularly for Deck, Construction/Manufacturing, and Engineering/Hull personnel. As would be expected, the rates for the oldest cohort, the men who entered service in 1945-1947, are considerably higher for such conditions as hypertension and cardiovascular disease than rates for the other cohorts. Large differences in hospitalization rates across decades also are noted for diabetes mellitus and ulcers. Moreover, not only are the rates across cohorts substantially higher but rates for these four diagnoses vary markedly across occupational groups. Because of this variability, age becomes a less cogent explanation for the observed differences in rates, thereby further implicating occupational factors, particularly when the similarity of rates across most occupations is noted for the first enlistment. Other factors, such as life style, personal habits, family history, background characteristics, and self-selection considerations also need to be examined to determine the degree of their relationship with stress-related illness incidence.

For the third phase of this study, various sources of job stress are identified and their possible association with stress-related hospitalization rates discussed. For example, men in the technical, administrative, and electronics groups, who have the lowest hospitalization rates, are in occupations rated as having favorable environmental and job characteristics as well as the highest levels of job status and transferability of skills. These occupations include the more highly specialized and white-collar jobs which would be performed in environmentally protected work areas. Individuals assigned to these specialties typically have high aptitude scores, extensive training, and skills sought in the civilian sector.

When compared with the technical, administrative, and electronics occupational groups, the jobs of Hospital Corpsman and Mess Management Specialist (which have the highest hospitalization rates over all decades) generally have lower job status, less favorable job characteristics, and less satisfactory environmental ratings. Perhaps of greatest importance, men assigned to these two occupations differ from others in that the specific work tasks have a direct relationship to the well-being of their shipmates (i.e., responsibility for others) which contrasts with those jobs that center on the operation and maintenance of equipment. Other researchers report that individuals who are responsible for the well-being of others tend to have higher job stress levels and health risks than workers employed in equipment-oriented jobs.<sup>1,5</sup> Mess Management Specialists have the added pressures of meeting deadlines three times a day in meal preparations and of trying to satisfy the food preferences of their shipmates. Other considerations used to explain the high illness incidence rates among Corpsmen are a close proximity to health care facilities, a heightened awareness of symptomatology, and perhaps a greater willingness to adopt the sick role.<sup>11</sup>

Other results of this study show that groups with the least favorable environmental conditions tend to have fairly comparable hospitalization rates (Construction/Manufacturing, Engineering/Hull, and Ordnance). The majority of jobs in these categories require considerable strength and stamina and frequently involve working under hazardous conditions in noisy, hot areas.

The Nondesignated group is rated as having high levels of job stress and demonstrates hospitalization rates at least twice those of nearly all other occupational groups. In comparison with other occupations, men in this group have the least job status, the most negative work identity, and the least desirable working conditions. As mentioned earlier, work typically performed by this group primarily involves tedious or unskilled chores. Opportunities for performing work perceived as vital to the military mission or for making decisions probably are extremely rare which undoubtedly differ from expectations held at the time of service entry.<sup>12</sup> Under these circumstances, it is not surprising that this group has the highest stress-related illness rates, particularly for Mental Disorders. Further, this group, as reported elsewhere, has the highest rates of premature attrition (as high as 70% during a 4-year enlistment), unauthorized absences, and desertions as well as the lowest mean aptitude scores.<sup>13,14</sup> In order to reduce these personnel losses, the Navy encourages Nondesignated men to select a specialty and to request the training required for that job. In fact, a recent policy has been implemented whereby eligibility for reenlistment is contingent upon assignment to a specific job.

To summarize, results of this study have identified high and low health risk occupations, potential stressors associated with these occupations, and the decade of a Navy career when health risks are greatest. Such findings are of importance to enlisted personnel who face the decision of whether or not to remain in the Navy beyond 20 years. Many individuals may conclude that the health risks of their particular occupational group are excessive during the decade and decide in favor of retirement. These results also are of importance to Navy officials who can recommend improvements in the environmental conditions for several occupational groups. Other findings point toward an increased awareness of the influence on health of such occupational factors as work load, responsibility for others, participation, and occupational status.

On the basis of these results several additional issues should be addressed. Further research is needed to determine relationships between stress-related illness and the factors of life style, personal habits, family history, social and ethnic background characteristics, and self-selection variables and the extent of each factor's association with health risks.

Other specific research issues center on the identification of risk factors related to the elevated rates of alcoholism in several occupations during the second enlistment, elevated rates for hypertension among Construction/Manufacturing personnel, and high rates of alcoholism in the Ordnance group during the third decade. With such information, it would be possible to provide a more comprehensive basis than exists at present for the development of health care prevention and intervention programs. Another research product that could evolve is the creation of improved physical and mental screening procedures to be implemented at various phases of a Navy career. Overall, it is to be hoped that findings of this research program will reduce the risks that an individual assumes when he or she decides to remain in the Navy for a career.

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stress-related illness during nearly all phases or decades of a Navy career. Other groups with elevated hospitalization rates included Construction/Manufacturing, Deck, Ordnance, and Engineering/Hull whereas the lowest rates were observed for Miscellaneous/Technical, Electronics, and Administrative/Clerical. The highest hospitalization rates for stress-related diseases were evidenced during the third decade. Job stress scores were computed from ratings of environmental characteristics, occupational stressors, and career considerations; high scores on these dimensions tended to be associated with increased illness. Implications of these results for prevention programs were discussed.